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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/558,628	07/13/2006	Ramiro Martinez-Gutierrez	10451.204-US	4622

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NOVOZYMES NORTH AMERICA, INC.  
500 FIFTH AVENUE  
SUITE 1600  
NEW YORK, NY 10110

EXAMINER
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UNDERDAHL, THANE E

ART UNIT	PAPER NUMBER
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1651

MAIL DATE	DELIVERY MODE
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07/27/2007

PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

<b>Office Action Summary</b>	<b>Application No.</b>	<b>Applicant(s)</b>	
	10/558,628	MARTINEZ-GUTIERREZ ET AL.	
	<b>Examiner</b>	<b>Art Unit</b>	
	Thane Underdahl	1651	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

#### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

#### Status

- 1) ☒ Responsive to communication(s) filed on 17 May 2007.
- 2a) ☒ This action is **FINAL**.                      2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

#### Disposition of Claims

- 4) ☒ Claim(s) 25-45 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 25-45 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

#### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

#### Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All    b) ☐ Some \*    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

#### Attachment(s)

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)                                | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                       | 5) <input type="checkbox"/> Notice of Informal Patent Application                       |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)<br>Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____  |

### DETAILED ACTION

This Office Action is in response to the Applicant's reply received 5/17/07. Claims 1-24 have been cancelled. Claims 25-45 are new.

#### ***Response to Applicant's Amendment***

In the response submitted by the Applicant the 35 U.S.C § 103 (a) rejection of claims 13-16 and 18-24 based on LaRoye et al., Antrim and Wang with support from Thompson et al. is withdrawn in light of applicant's amendment. Also the 35 U.S.C § 112 rejection of claim 14-17, 21, 23, and 24 is withdrawn in light of the Applicant's amendment.

#### **Rejections Necessitated by Applicant's Amendment**

##### ***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 25-28, 32 and 35-45 are rejected under 35 U.S.C. 103(a) as being unpatentable over LaRoye et al. (WO 97/42301) in view of Antrim (U.S. Patent # 5,180,669, 1993) and Silver (U.S. Patent # 4795101) with support from Thompson et al. (U.S. Patent # 6,468,355, 2002).

These claims are drawn to a method of producing ethanol, said method comprising the steps of:

- a. providing a mash comprising a starch containing material and water;
- b. preliquefying the mash of step (a) in the presence of a beta-glucanase;
- c. gelatinizing the mash of step (b) by jet cooking;

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- d. liquefying the mash of step (c) in the presence of an alpha-amylase, a beta-glucanase and a xylanase; and
- e. saccharifying and fermenting the mash of step (d) to produce ethanol.
- f. recovering the ethanol.

LaRoye et al. teach a method of liquefying a mash from cereal grains using a mixture of enzymes including  $\beta$ -glucanase,  $\alpha$ -amylase and endo-xylanase (see abstract) for a fermentation process to produce ethanol using the yeast (page 2, lines 34-36) from the *Saccharomyces* species (page 1, lines 15-20). They also teach their  $\beta$ -glucanase is derived from *Bacillus* (page 5, lines 19-23), their xylanase from *Aspergillus* (page 5, lines 23-25). They also teach that suitable materials for their invention are high starch cereal grains such as barley, sorghum, corn and wheat (page 3, lines 28-33). They also teach the use of proteases to liquefy and saccharify their mash.

While LaRoye et al. does not teach the use of tubers. However it would be obvious to one of ordinary skill in the art to substitute any of these substrate into the mash for a fermentation process since they contain high amounts starch which can be fermented into ethanol. This is supported by Thompson et al. who teach that the grains listed above as well as potato, sweet potato, cassava, and sago also have a high starch content (col 5, lines 1-5) and are susceptible to fermentation (col 1, lines 48-55). They also teach that their liquefaction step which includes  $\beta$ -glucanase is performed at a temperature about 65 °C from 30 minutes to 2 hours (page 3 line 33 to page 4 line 15). LaRoye teaches preliquefying the grains to a mash with enzymes such as  $\beta$ -glucanase and cellulases which inherently reduce  $\beta$ -glucans found in the above starch

containing whole grains to glucose and thus (see Abstract and page 3, lines 30-40 and page 1, lines 20-40).

What LaRoye does not teach is a step to gelatinize the mash via jet cooking. However LaRoye teach that liquefaction steps may be improved by the teachings contained in the patent by Antrim. Antrim et al. like LaRoye teach the use of  $\alpha$ -amylase to improve the liquefaction of starch. Antrim teach jet cooking the starch as a treatment for liquefaction (Antrim, col 4, Example 2). One of ordinary skill in the art would recognize that steam treatment of starch will gelatinize the mash and make it more susceptible to enzymatic digestion to glucose. One of ordinary skill in the art would be motivated by the fact that improved susceptibility of the substrate to enzymatic digestion to glucose and will improve the over yield of the end product (ethanol) and reduce the reaction time. Additional motivation is provided by LaRoye who references the work by Antrim in their process to produce ethanol from a substrate mash. The reasonable expectation of success is provided by LaRoye who successfully ferments ethanol from a mash of cereal grains.

While LaRoye and Antrim do not specifically teach the all the temperature ranges and duration of the claims, specifically claim 43. However, M.P.E.P. § 2144.05 II states:

Generally, differences in concentration or temperature will not support the patentability of subject matter encompassed by the prior art unless there is evidence indicating such concentration or temperature is critical.

Absent any teaching of criticality by the applicant concerning the time and temperature listed in claims, it would be *prima facie* obvious that one of ordinary skill in the art would

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recognize that these parameters of time and temperature listed in claims are result effective variables whose ratio and concentration are a matter of routine optimization.

Also while LaRoye teach that their fermentation and saccharification are performed as separate steps. It would be obvious to one of ordinary skill in the art since the art has numerous teachings on converting stepwise fermentations to simultaneous saccharification and fermentation. Furthermore M.P.E.P. § 2144.04 V B, C, E, support that general statements making a process either separate, sequential or simultaneous is obvious.

While both of the above references teach some type of pretreatment of to the mash LaRoye et al. teach the addition of a cellulases,  $\beta$ -glucanase, and  $\alpha$ -amylase to hydrolyze the cellulose and start to make it more amorphous to improve enzyme access to the substrate. Antrim teach an acid hydrolysis process to make the substrate more amorphous. However neither specifically teach a pretreatment of  $\beta$ -glucanase in the mash before jet-cooking. Regardless this would be obvious to one of ordinary skill in the art by the time the invention was made in view of the teachings of Silver.

As with LaRoye et al. and Antrim, Silver too uses cellulase enzymes to mill grains such as corn (Silver, See Abstract). Silver uses GENCORE CELLULASE 150 L to steep their corn kernels (Silver, col 5, lines 30-45) before Jet Cooking (Silver, col 8, lines 10-15). Silver teach that GENCORE CELLULASE 150 L contains both endoglucosidase and  $\beta$ -glucanase (Silver col 6, lines 60-65).

It would have been obvious to someone skilled in the art to combine the teachings of Silver with those of LaRoye et al. and Antrim since all three work with the

same substrate corn with enzymes such as  $\beta$ -glucanase to improve the amount of glucose obtained from corn, particularly from its starch. The motivation and the reasonable expectation of success is derived from their use of common materials to achieve common goals, namely the milling or mashing of corn to obtain more glucose from corn and starch.

Since Silver already teaches the addition of endoglucanase before the gelatinization of the corn to the method it would be obvious to alter the sequence to add endoglucanase in the later steps or add more endoglucanase later in the absence of evidence of criticality to the contrary (see M.P.E.P. § 2144.04 IV C and 2144.04 VI B).

Furthermore while Silver does not teach that the specific origin that his endoglucanase is derived one of ordinary skill in the art would recognize that endoglucanases, regardless of origin are art recognized equivalents for the same purpose and it would be obvious for one of ordinary skill in the art to substitute one endoglucanase for another in the absence of evidence of criticality to the contrary (M.P.E.P. § 2144.06).

Therefore the references listed above renders obvious claims 25-45.

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

**In response to this office action the applicant should specifically point out the support for any amendments made to the disclosure,** including the claims (MPEP 714.02 and 2163.06). Due to the procedure outlined in MPEP § 2163.06 for interpreting claims, it is noted that other art may be applicable under 35 U.S.C. § 102 or 35 U.S.C. § 103(a) once the aforementioned issue(s) is/are addressed.

Applicant is requested to provide a list of all copending U.S. applications that set forth similar subject matter to the present claims. A copy of such copending claims is requested in response to this Office action.

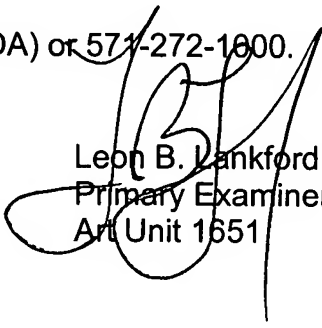
#### CONTACT INFORMATION

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Thane Underdahl whose telephone number is (571) 272-9042. The examiner can normally be reached Monday through Thursday, 8:00 to 17:00 EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Michael Wityshyn can be reached at (571) 272-0926. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1800.

Thane Underdahl  
Art Unit 1651



Leon B. Vankford Jr  
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